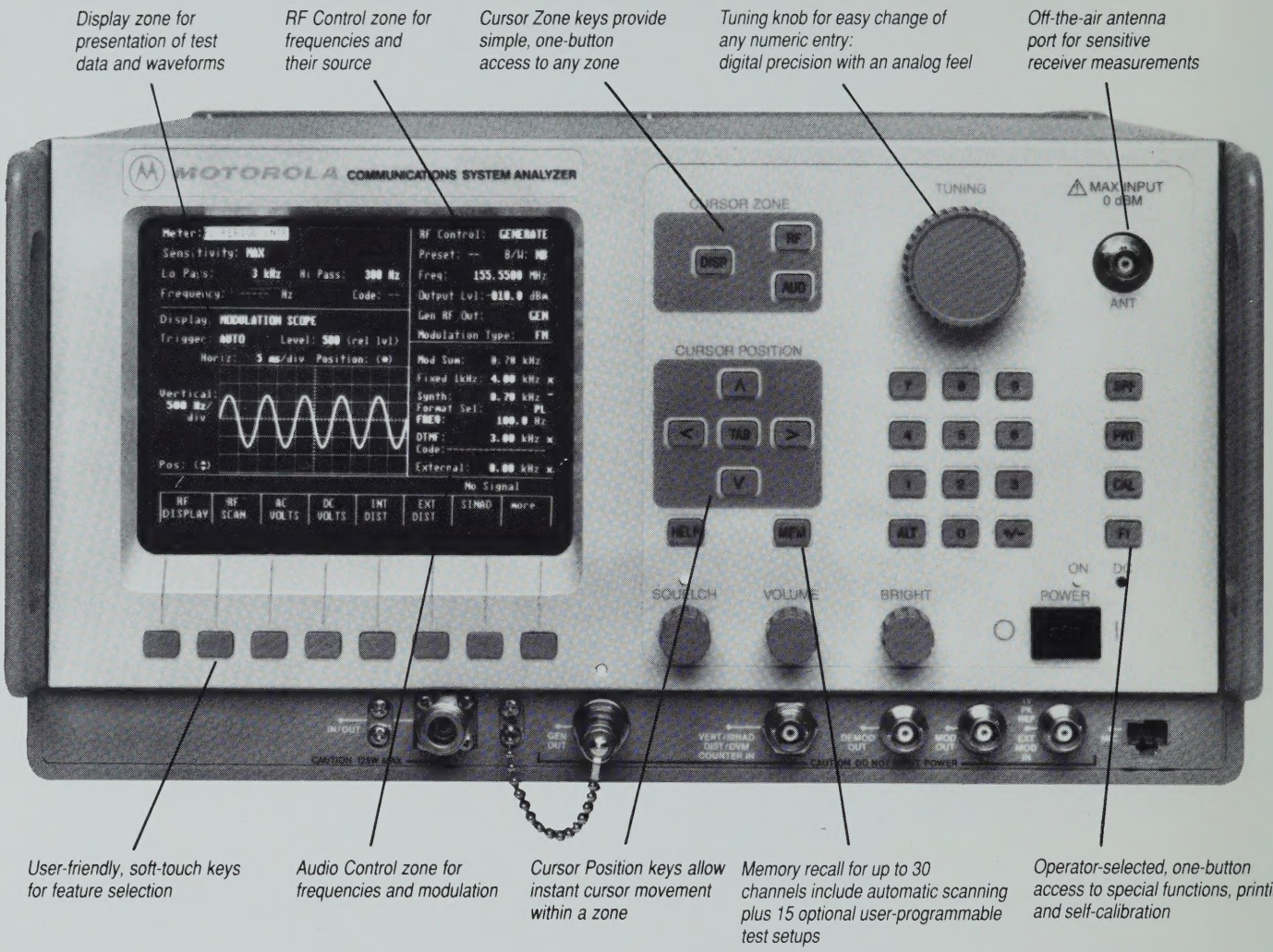
Eq. Cat.	Sec.	Item
R3	9	81E

MOTOROLA

R-2600
Communications System Analyzer


Display zone for presentation of test data and waveforms
RF Control zone for frequencies and their source
Cursor Zone keys provide simple, one-button access to any zone
Tuning knob for easy change of any numeric entry: digital precision with an analog feel
Off-the-air antenna port for sensitive receiver measurements
MOTOROLA COMMUNICATIONS SYSTEM ANALYZER
CURSOR ZONE
TUNING
MAX INPUT 0 dBM
ANT
CURSOR POSITION
SQUELCH
VOLUME
BRIGHT
POWER
User-friendly, soft-touch keys for feature selection
Audio Control zone for frequencies and modulation
Cursor Position keys allow instant cursor movement within a zone
Memory recall for up to 30 channels include automatic scanning plus 15 optional user-programmable test setups
Operator-selected, one-button access to special functions, printing and self-calibration

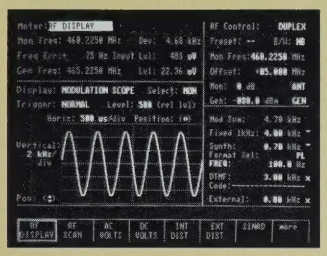
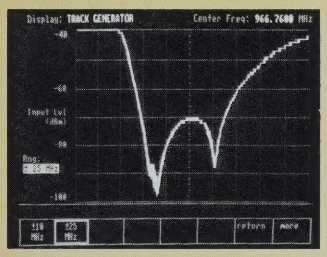
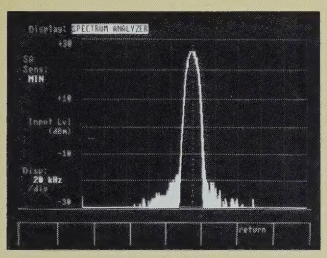
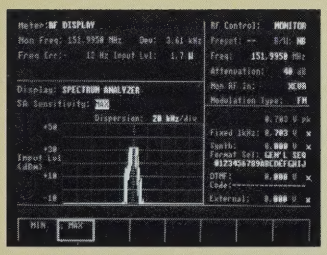
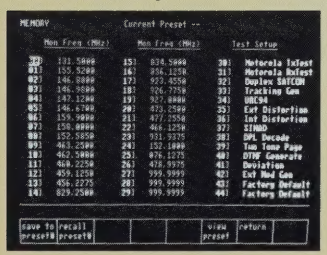
From Motorola, a world leader in field service Test Equipment, comes the latest generation of world class high performance equipment: the Motorola R-2600 Communications System Analyzer. Versatile, rugged, compact and portable, this test instrument is built specifically for the service and maintenance of communications equipment. Designed to improve a technician's efficiency and accuracy, the cost of servicing can be reduced since the Communications System Analyzer performs functions that otherwise would require many separate instruments. Servicing can be done faster because less time is spent unpacking, hooking up, disconnecting and repacking multiple pieces of test equipment.

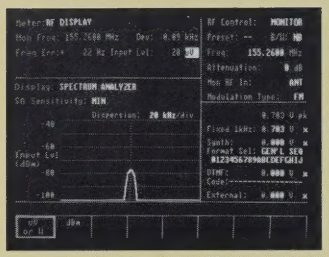
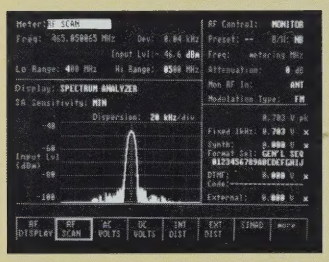
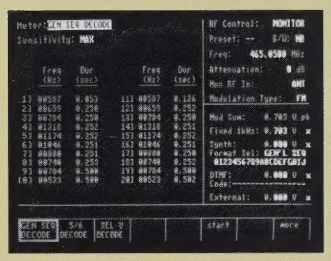
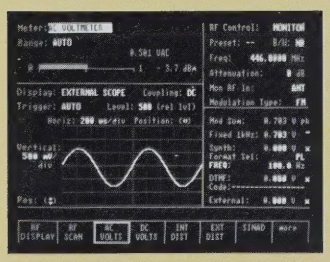
The R-2600 features user-programmable permanent storage locations for fast, easy access to frequently used channel information and customized test setups. It also includes digitized screen displays for storage and printout, innovative use of soft keys and windowing, fast reacting autoranging scales with both analog and digital readouts, signaling encode and decode functions as well as the reliable, rugged operation that is essential in the field service environment.

The Communications System Analyzer performs a variety of tests normally associated with these devices:

- RF Signal Generator
- Sensitive Measurement Receiver
- Scanning Receiver
- Spectrum Analyzer
- Duplex Offset Generator
- Frequency Counter
- AC/DC Voltmeter
- Oscilloscope
- RF Wattmeter
- Signal Strength Meter
- Frequency Error Meter
- SINAD Meter
- Distortion Meter
- Sweep Generator
- Audio Generator
- Signaling Simulator

FOR FUTURE TECHNOLOGIES

Feature	Description	Benefits
Duplex 	Full output level control from –130 dBm to 0 dBm over the entire range of the instrument is available from the RF I/O port (–130 dBm up to –50 dBm) and the generator port (–80 dBm to 0 dBm). Variable offsets from 0 to ± 55 MHz in 5 kHz steps are keypad selectable.	The duplex generator provides enhanced capability to service equipment such as repeaters and full duplex radios, including cellular telephones. Full RF level control as well as full internal and external modulation capability allow receiver (desensitization) and transmitter tests to be performed simultaneously through one port if desired. Storage of test setups is available in memory for instant recall.
50 MHz Tracking Generator 	The combining of the capabilities of the sweep generator and the spectrum analyzer into a Tracking Generator function allows the user to view the performance characteristics of many RF filter devices. Display range is operator selectable from a 200 kHz window up to a 50 MHz window anywhere in the 400 kHz to 1 GHz spectrum.	Diagnosis and adjustment of critical receiver front ends, IFs, helical filters, cavities, combiners and duplexers can be made in a few minutes, quickly and easily with the flexibility of the R-2600's tracking generator at your fingertips.
Spectrum Analyzer (See & Hear)™ 	The built-in Spectrum Analyzer of the R-2600 will display a window of RF spectrum anywhere within the 400 kHz to 1 GHz operating range of the unit. The EXPAND softkey enlarges the display to fill the CRT and retains dispersion and center frequency control. **Optional Markers/100 MHz Window** Functional markers include the following features: • Freeze • Max Level Hold • Peak Level Hold • Absolute Level & Frequency • Delta Level & Frequency	The significant advantage of spectrum visibility while being able to hear and store for detailed analysis through use of multiple markers (optional) is provided the user. The Tuning Knob retains control of the center frequency even in the EXPAND mode to perform fast sweeps or fine tuning. This allows the technician to quickly locate and identify signal carriers. This full screen spectrum analyzer is a very powerful and effective tool for the technician.
Terminated RF Wattmeter 	RF power anywhere in the operating range of 400 kHz to 1 GHz is automatically measured by the Communications System Analyzer tuned to that frequency. The built-in RF load dissipates up to 125 watts for one minute. If a high power transmitter should be keyed into the unit for any longer, the CRT display changes to read "WARNING RF OVERLOAD" thus warning the technician to un-key.	Provides calibrated RF power measurements to eliminate the need for a separate wattmeter. The CRT display also includes frequency error, and modulation level simultaneously.
Programmable Test Memory 	**Channel Presets** – The unit has 30 memory locations which can be used to store preset channel information. Channels can be easily selected individually or automatically scanned over a user defined range. **Programmable Test Setups** (Optional) – the user can easily program and store up to 15 of the most commonly used test setups, including all test conditions, measurement display formats, and levels. These memory positions operate fully independently from the channel presets.	**Channel Presets** – Quickly recall and access often used channel location information to speed testing. Scanning allows automatic monitoring and measurement of activity on channels of interest. **Programmable Test Setups** (Optional) – Significantly reduce the number of key presses required to set up the more commonly used test setups, greatly increasing operator efficiency and promoting uniform test procedures. The user can also assign a custom name to the test for easy recall.

Feature	Description	Benefits
Relative Signal Strength Meter 	In addition to reading frequency error and modulation, a digital readout relative signal strength meter has been included. Sensitivity is specified to –100 dBm at the antenna port for FM signals and extends up to 125 watts at the RF I/O port. The CRT display will automatically convert to a terminating "watts" display as the level increases.	This feature, in conjunction with an external antenna, allows remote monitoring of distant transmitters to check for antenna, transmission line or P.A. problems. Many technicians also find this feature convenient in performing propagation studies to identify weak coverage areas.
RF Scan/ RF Counter Function 	RF Scan operates in the monitor mode and provides a function similar to a 1 GHz counter. This feature automatically scans a user defined frequency range to lock to the signal applied. Any RF carrier above 20 MHz can be located within 5 seconds or less and the reception displayed with digital readouts.	It is possible to locate and identify the operating frequencies of multi-channel radios. This feature allows the technician to conveniently and immediately verify the programming of a multi-channel radio PROM. By automatically tuning the R-2600 receiver to the detected carrier, immediate measurement data can be taken without having to enter new frequency data via the keyboard. The 1 GHz counter on your bench is now obsolete.
Signaling Simulator: Encoder and Decoder 	The System Analyzer includes the capability of encoding and decoding PRIVATE LINE (PL), DIGITAL PRIVATE LINE (DPL), and single tone sequences as well as multi-tone sequences including DTMF signals, 5/6 tone paging, Select V and up to 20 sequential tones. Decoding displays include tone frequencies and time durations of the individual tones. The unit can also encode tone remote signaling.	The signaling capability of the R-2600 reaches a broader range of service applications with its decode capability. This gives the service technician a more flexible test instrument which aids in servicing paging equipment, specialized signaling encoders as well as mobile, portable and other radio products. The signaling simulator can perform a full system check-out faster, with more accuracy than ever before.
General Purpose & Modulation Oscilloscope 	This oscilloscope has a 50 kHz bandwidth for audio waveform analysis. The display can be triggered over the full screen range to a fixed reference level. Triggering in both automatic and normal modes is provided for synchronizing the horizontal timebase to the vertical input signal. Internal or external inputs allow observation of both generated and monitored modulation signals. Softkeys provide for an enlarged full screen display. **OPTIONAL MARKERS** Functional markers include the following features: • Delta Voltage • Delta Period • Delta Frequency	Recovered audio or internally produced audio can be displayed visually for deviation measurements. Additionally, detection of an asymmetric modulation or audio distortion can be achieved with waveform analysis. With internal and external triggering and a freeze display single sweep, this unit duplicates many features of more expensive scopes. Optional markers allow detailed analysis to measure waveforms displayed on the CRT. The EXPAND function provides an uncrowded, easy to interpret view of the signal for quick analysis.

Feature	Description	Benefits
AM, FM Signal Generator	When the GENERATE mode is selected, the RF modulation method, carrier frequency, bandwidth, composite audio modulation, and R.F. signal level output are displayed on the CRT.	Receiver testing time is reduced. This flexible, self calibrating signal generator is complimented by the simultaneous display of all necessary control information.
Off-the-Air Sensitive Receiver	The 2 microvolt sensitivity of the R-2600 is available through the antenna port. This allows off-the-air monitoring of remote transmitters operating up to 1 GHz. Variable squelch aids in picking up weak signals but can be set tighter to ensure the proper S/N ratio for measurement accuracy.	This enables frequent preventive maintenance system degradation parameter checks or interference identification without leaving the shop, thus reducing service costs.
Graphic Screen Print, and Self Calibration	These commands are provided as immediate action functions. Dedicated keys on the front panel provide easy access.	Graphic screen print provides hardcopy of test data, improving the quality of customer documentation. Self calibration insures measurement accuracy of RF input, output and modulation at the touch of a button.
RS-232/Serial Printer Interface (Standard)	A full bi-directional RS-232 port is standard and includes the capability to respond to serial input command vocabulary and return measurement results as a serial output stream. Included are user selectable baud rates (up to 9600 bps) and start, stop and parity bit selection. In addition, this dual function port can drive an optional serial printer to print out data and graphic displays.	Remote monitoring of cell sites and off-the-air measurements of radio equipment located at distant, out of range sites can be performed without ever leaving the shop. Users with large volume repetitive testing requirements can write their own programs to cut their test time costs. Printed results can be used as part of the service shop's internal quality control system, and can be used to demonstrate performance to the user of the radio equipment.
IEEE-488.2 Interface (Optional)	The necessary interface hardware and software for 488.2 bus operation.	IEEE-488.2 interface capability enables the System Analyzer to perform fully automated testing. Any one of various programmable controllers are suitable for this application.
Cable Fault (Optional)	Cable fault, length and propagation velocity are new RF measurement features which help the technician to isolate cable defects. Supported by on-screen prompts and user-selectable Help messages, the technician can quickly set up and accurately determine the distance to a fault on a coaxial cable. The distance to fault (or cable length) is computed and displayed in feet or metric units.	Cable fault locating techniques are mandatory for site servicing, where visual inspection is not practical, safe, or effective in detecting hidden or cold-flow damage. The semi-automatic operation of the cable fault finder precludes the use of mathematical formulae and manual calculations, maximizing the technician's on-site productivity.
Cellular Testing (Optional) **Subscriber Testing**	Will test and verify a celular radio's response to complex system protocols and commands. Test routines for cell initiated or mobile initiated call simulations are available. – EAMPS – ETACS – NAMPS – JTACS – NTACS	With the cellular option, the Communications System Analyzer becomes a truly full performance service monitor. Also available as options are both C-Message and CCITT filters for precise audio response measurements.
Cell Site Testing	Tests the base site per the Motorola Optimization Manual automatically. Fully optimizes all Signaling and Voice transceivers as well as Scan Receivers and RDMs. Also included is an antenna system test that calculates antenna VSWR while providing a graph of performance over frequency.	Site performance can now be evaluated in less time than previously possible. Complete automatic control of the exact recommended RF testing mechanics eliminates the opportunities for measurement and calibration errors. A complete and comprehensive test system ensures optimum RF system performance.

SPECIFICATIONS

Operating/Display

Modes:	AM/FM Monitor AM/FM Generate Audio Synthesizer Spectrum Analyzer Duplex Generator Sweep Generator Frequency Counter Digital Voltmeter Wattmeter Oscilloscope Signal Strength Meter SINAD/Distortion Meter

RF Signal Generator

FREQUENCY	
Range:	400 kHz – 1 GHz
Resolution:	100 Hz
Accuracy:	Refer to Accuracy of Master Oscillator
Stabilization Time:	.1 Second
OUTPUT	
Range FM:	–130 dBm to 0 dBm
Range AM:	–130 dBm to –3 dBm
Accuracy:	±2 dB from –80 dBm to –130 dBm (RF I/O PORT) ±4 dBm for all other output levels and ports. 3 MHz to 1 GHz
SWEEP GENERATOR	
Range:	400 kHz – 1 GHz
Resolution:	100 Hz
Output:	–130 dBm to 0 dBm
Sweep Width:	Selectable up to ±5 MHz of center freq.
Scope Coupling:	Synchronized scope trace to the sweep signal
Accuracy:	Same as Signal Generator
DUPLEX GENERATOR	
Range:	400 kHz – 1 GHz
Resolution:	100 Hz
Output:	–130 dBm to 0 dBm
Frequency Offset:	0 MHz to ±55 MHz in 5 kHz steps
Accuracy:	Same as Signal Generator
SPECTRAL PURITY	
Spurious:	–35 dB below fundamental up to ±20 MHz of center frequency
Harmonics:	–20 dB below fundamental
FM MODULATION	
Deviation:	99.5 kHz
Accuracy:	5% of setting ±25 Hz @ 1 kHz (NB) 5% of setting ±250 Hz @ 1 kHz (WB)
Residual FM:	20 Hz max @ 300 Hz to 3 kHz from fc
External/Internal Frequency Range:	5 Hz to 20 kHz, ±2 dB
AM MODULATION	
Range:	0-90%
Accuracy:	10% of modulation
Residual AM:	1.0% max @ 300 to 3 kHz from fc
External/Internal Frequency Range:	100 Hz to 10 kHz, ±1 dB
PHASE MODULATION	**(Optional)**
Range:	0.5 to 10 radians
Accuracy:	±8% at 1KHz
Resolution:	.1 radians (.01 below 2.00 radians)
External/Internal Frequency Range:	300 to 3000 Hz

Audio Modulation Synthesizer

Modulation types:	1 kHz tone, PRIVATE LINE, DIGITAL PRIVATE LINE, Single Tone, DTMF, Two-Tone Paging, 5/6 Tone Paging, International Select V, 20 Tone General Sequence, Tone Remote Control, External inputs from both a supplied microphone and BNC input.
Frequency Range:	10 Hz to 20 kHz ±1 dB
Mod Output Level:	Programmable into 7.95 v peak
Mod Output Impedance:	100 ohms nominal
1 kHz Tone Distortion:	Not to exceed 1%
External Modulation Inputs:	Front panel microphone and a BNC jack are summed.
BNC Input Impedance:	600 ohms nominal
Microphone Supplied:	HMN-1056D
Microphone Input Conditioning:	Internal audio limiting providing IDC and pre-emphasis.

RF Receiver

FREQUENCY	
Range:	400 kHz – 1 GHz
Resolution:	100 Hz
Accuracy:	Refer to Accuracy of Master Oscillator
Spurious Response:	40 dB typical
SENSITIVITY (Above 10 MHz)	
Narrowband FM:	2.0 uV for 10 dB EIA SINAD
Wideband FM:	10 uV for 10 dB EIA SINAD
FREQUENCY ERROR METER	
Type of Display:	Autoranging
Resolution:	1 Hz
FM DEVIATION MEASUREMENT	
Demod Range:	Up to ±5 kHz in Narrowband Up to ±75 kHz in Wideband
Accuracy:	±5% plus peak residual FM
Frequency Response:	Selectable per the following: Low Pass Filters 20 kHz, 3 kHz, 300 Hz High Pass Filters 5 Hz, 300 Hz, 3 kHz
Demodulated Output Level:	.8 v peak per 1 kHz peak Deviation in Narrowband and per 10 kHz Deviation in Wideband
Demodulation Output Impedance:	100 ohms nominal
Deviation Alarm:	Audible, set via keypad in 100 Hz increments

SPECIFICATIONS

RF Receiver (Cont)

AM MODULATION MEASUREMENTS	
Demodulation	
Range:	0 to 100%
Accuracy:	±5% for levels below 80%
Frequency	
Response:	Selectable per the following: Low Pass Filters 20 kHz, 3 kHz, 300 Hz High Pass Filters 300 Hz, 3 kHz
Demodulated	
Output Level:	.8 v peak per 10% AM modulation

PHASE DEMODULATION	
MEASUREMENTS	**(Optional)**
Demod Range:	Narrowband= 1 radian Wideband = 10 radians
Accuracy/	±5% at 1 kHz, ±7.5% 300 Hz to
Frequency Response:	3.5 kHz with de-emphasis filter cornered at 100 Hz

Metering & Measurement

SPECTRUM ANALYZER – SEE AND HEAR™	
Frequency Range:	400 kHz to 1 GHz
Dispersion:	Selectable from keypad per following: 200 kHz window – (20 kHz per div) 500 kHz window – (50 kHz per div) 1 MHz window – (100 kHz per div) 2 MHz window – (200 kHz per div) 5 MHz window – (500 kHz per div) 10 MHz window – (1 MHz per div)
Optional :	20 MHz window – (2 MHz per div) 50 MHz window – (5 MHz per div) 100 MHz window – (10 MHz per div)
Dynamic Range:	60 dB
Bandwidth:	6 kHz/30 kHz automatically selected
Display Range:	+50 to –95 dBm
Optional Markers:	Freeze, Max Hold, Peak Hold Delta or Absolute level and frequency

SIGNAL STRENGTH INDICATOR	
Range:	3 MHz to 1 GHz
Accuracy:	±4 dB
Sensitivity:	–100 dBm (antenna port rating)

WATTMETER (RF I/O PORT)	
Frequency Range:	3 MHz to 1 GHz
Measurement Range:	.1 watt to 125 watts
Input Impedance:	50 ohms with maximum VSWR of 1.5:1
Accuracy:	±10%
Protection:	Over temperature alarms

TRACKING GENERATOR	
Frequency Range:	400 kHz to 1 GHz
Tracking Display	
Sweep Range:	200 kHz window – (20 kHz per div) 500 kHz window – (50 kHz per div) 1 MHz window – (100 kHz per div) 2 MHz window – (200 kHz per div) 5 MHz window – (500 kHz per div) 10 MHz window – (1 MHz per div) 20 MHz window – (2 MHz per div) 50 MHz window – (5 MHz per div)
Display Range:	0 to –80 dBm

Metering & Measurement (Cont)

CABLE FAULT	**(Optional)**
Method:	Standing Wave Analysis
Measure:	Fault distance, cable length
Reading:	Feet and meters
Accuracy:	10%

OSCILLOSCOPE	
CRT Size:	9 cm x 11 cm (approx. 7 inch diagonal) raster scan display with four intensity levels
Frequency	
Response:	0 to 50 kHz
Vertical Input	
Ranges:	Selectable per the following: 10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1v, 2v, 5v, 10v per division
Accuracy:	5% of full scale all ranges
Sweep Ranges:	Selectable per the following: 20 usec, 50 usec, 100 usec, 200 usec, 500 usec, 1 msec, 2 msec, 5 msec, 10 msec, 20 msec, 50 msec, 100 msec, 200 msec, 500 msec, 1 sec per division
Trigger:	Automatic, normal, and single sweep
Optional Markers:	Delta Voltage, Delta Frequency, Delta Period

DIGITAL VOLTMETER	
Meter type:	RMS
Frequency Range:	DC plus AC of 50 Hz to 20 kHz
DC Voltage Ranges:	1.0 V, 10.0 V, 100 V full scale
Accuracy:	1% full scale ±1 least significant digit
AC Voltage Ranges:	1.0V, 10.0 V, 70 V full scale
Accuracy:	5% full scale ±1 least significant digit
Freq. Response:	3 dB end points @ 50 Hz and 20 kHz

FREQUENCY COUNTER	
Frequency Range:	5 Hz to 500 kHz plus Auto Tune
Period Counter	
Range:	5 Hz to 20 kHz
Input Level:	.1 v RMS minimum input level
Resolution:	.1 Hz, 1 Hz, 10 Hz, 100 Hz, and 1 kHz varying by frequency range
Auto Tune:	Monitor mode, 20 MHz to 1 GHz, unit will scan and find signals greater than –30 dBm
Accuracy:	See **TIME BASE**

SINAD/DISTORTION METER	
Input Level:	.1 V to 10 V RMS
SINAD Accuracy:	±1 dB at 12 dB SINAD
Distortion Range:	1% to 20%
Distortion Accuracy:	±0.5% of distortion or ±10% of reading whichever is greater
Optional:	C-Message Filter; CCITT Filter w/600 ohm switchable load

TONE SEQUENCE DECODE	
Modulation types:	PRIVATE LINE, DIGITAL PRIVATE LINE, Single Tone, DTMF, Two-Tone Paging, 5/6 Tone Paging, International Select V, 20 Tone General Sequence.
Frequency Accuracy:	±3% from 300 Hz to 3 kHz
Duration Accuracy:	±12 msec for tones greater than 30 msec and 300 Hz

SPECIFICATIONS

Metering & Measurement (Cont)

RS232 PORT (Requires special cable)/Optional IEEE488.2
Bidirectional port provided with capability to respond to serial (optional parallel) input command vocabulary to activate functions and return measured results. Baud rates to 9600 BPS with selectable start, stop and parity bits.

TIME BASE	
Standard TCXO:	Aging 1 ppm/yr, Temperature 1 ppm
Optional OCXO:	Aging .5 ppm/yr, Temperature .05 ppm

Power and Environmental

AC:	100-130 VRMS or 200-260 VRMS @ 50 Hz to 440 Hz
DC:	+11 TO +16 VDC
Battery Option:	13.6 V, 50 minutes typical
Dimensions:	8.5" high x 16" wide x 17" deep (21.6 cm x 40.7 cm x 43.2 cm) excluding accessories, battery pack and cover
Weight:	33 pounds (Basic model excluding accessory cover)
Temperature:	0°C to +50°C (operating) –40°C to +85°C (storage)

Interface Ports

Printer/Remote Control:	RS-232 DB25 (female)
Color Monitor:	Standard CGA, RGB DB9 (female)

Model Nomenclature

R-2600C	**Communication System Analyzer w/Tracker**
R-2600CHS	**R-2600C with OCXO Timebase**
R-2600CNT	**Comm. System Analyzer w/Tracker Deleted**
R-2600CNTHS	**R-2600CNT with OCXO Timebase**
R-2600CCBS	**Cell Site Auto Test System (Motorola sites)**
R-2600CSP	**Cell Site Test Unit w/o Accessories or Test Software**

Model Nomenclature (Cont)

Factory Installed Option Chart
(Order as additional line items with Basic Model R-2600)

EAMPS ONLY	**RLN-4259A**
ETACS ONLY	**RLN-4260A**
JTACS, NTACS	**RLN-4261A**
EAMPS, NAMPS	**RLN-4262A**
CABLE FAULT	**RLN-4306A**
IEEE 488.2	**RLN-4329A**
C-Message Filter	**RLN-4034A**
CCITT Filter	**RLN-4361A**
Hi Performance Spectrum Analyzer/ Marker Package	**RLN-4423A**
Phase Mod/ Demod	**RLN-4484A**
Progr. Test Setup Memory	**RLN-4485A**

Accessories Supplied:	
Oscilloscope Probe	RTL-4011A
BNC to N Adapter	58-84300A98
DC Power Connector Kit	RPX-4097A
Antenna	TEKA-24A
Microphone	HMN-1056D
Signal Generator Termination (50 Ohm)	58-80386B73
Operator Manual	68-80386B72
Power Cord	30-80397A62
Spare RF Fuses	GG6530277C002

Optional Accessories:	
Battery Pack	RPN-4000A
Canvas Case	15-80357B77
Transit Case	15-80388B06
Maintenance Manual	RLN-4120B
RF Detector Probe	RLN-4075A
RF 50 Ohm Terminated Probe	58-80345B96
Telescoping Antenna	RTA-4000A
RGB Cable (DB9 male to DB9 male)	30-80387B60
RS-232 Interface Cable (DB25 male to DB9 female)	30-80387B59
RS-232 Adapter for Computer Port (DB9 male to DB25 female)	HLN-9390A
Serial/Parallel Dot Matrix Printer	RLN-4375A
Serial Printer Cable (Special) (DB25 male to DB25 male)	30-80387B58
Rubidium Standard	R-1192A
CBS Acessory Kit	REX-1083A
CBS Auto Test Software (Motorola)	RVN-5001A

MOTOROLA

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For further information, in the U.S. call 1-800-505-TEST (1-800-505-8378).
Outside the U.S. contact your nearest Motorola representative.

Support Services

For service on your Motorola test equipment in the U.S. contact the Motorola Test Equipment Service Depot:

1308 Plum Grove Road
Schaumburg, IL 60173
1-800-323-6967

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